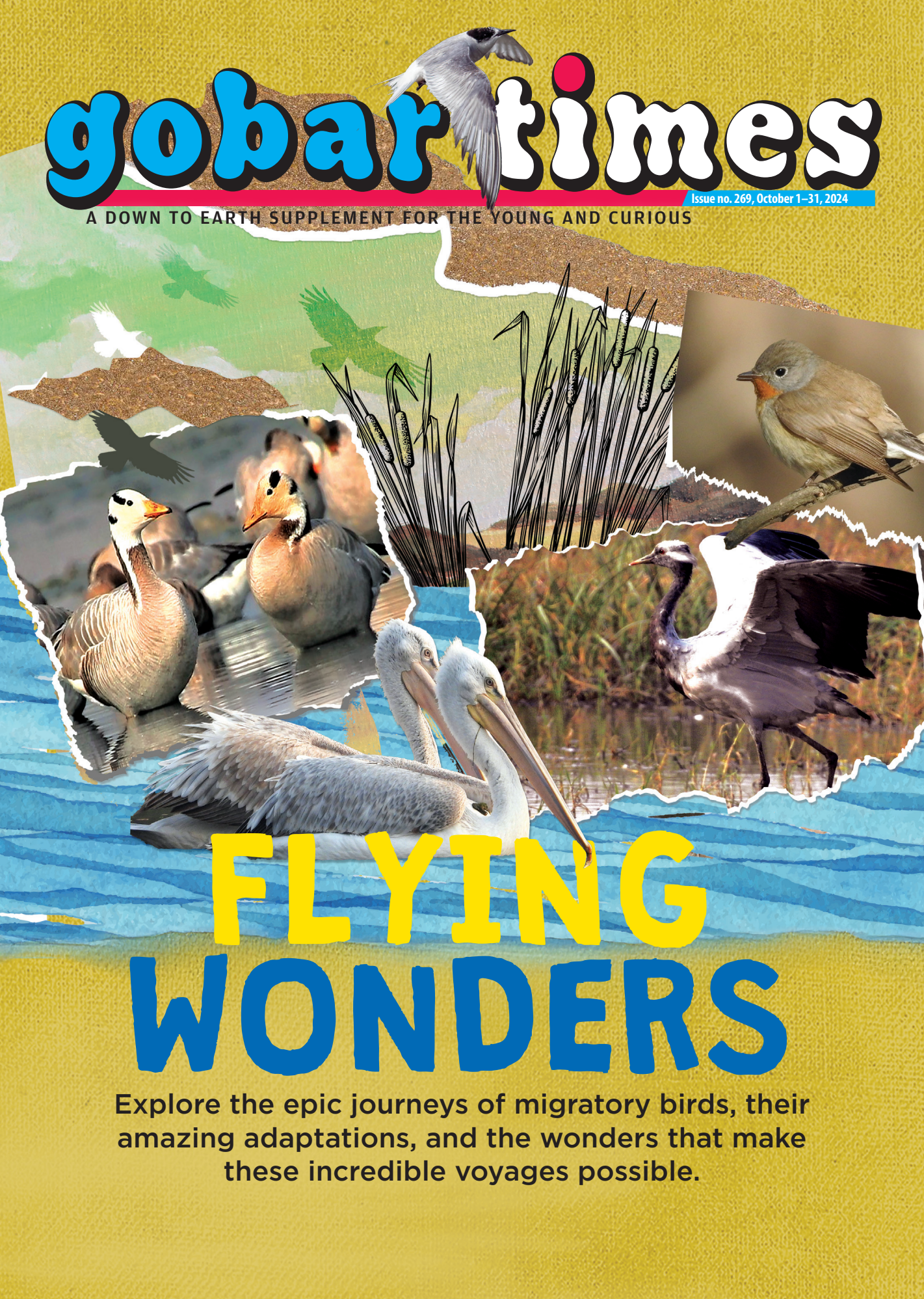


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A DOWN TO EARTH SUPPLEMENT FOR THE YOUNG AND CURIOUS

FLYING WONDERS

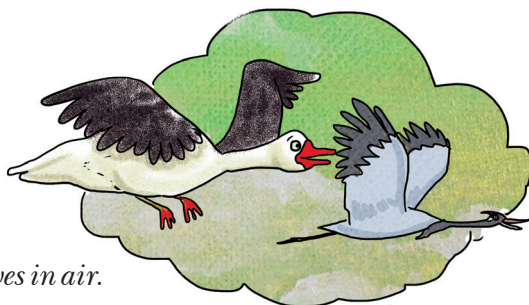
Explore the epic journeys of migratory birds, their amazing adaptations, and the wonders that make these incredible voyages possible.



Gargi Mishra

Birds migrate thousands of kilometres every year. Why do they undertake such perilous journeys?

Flights of Longings



They try their fluttering wings, and trust themselves in air.

But whether upward to the moon they go,

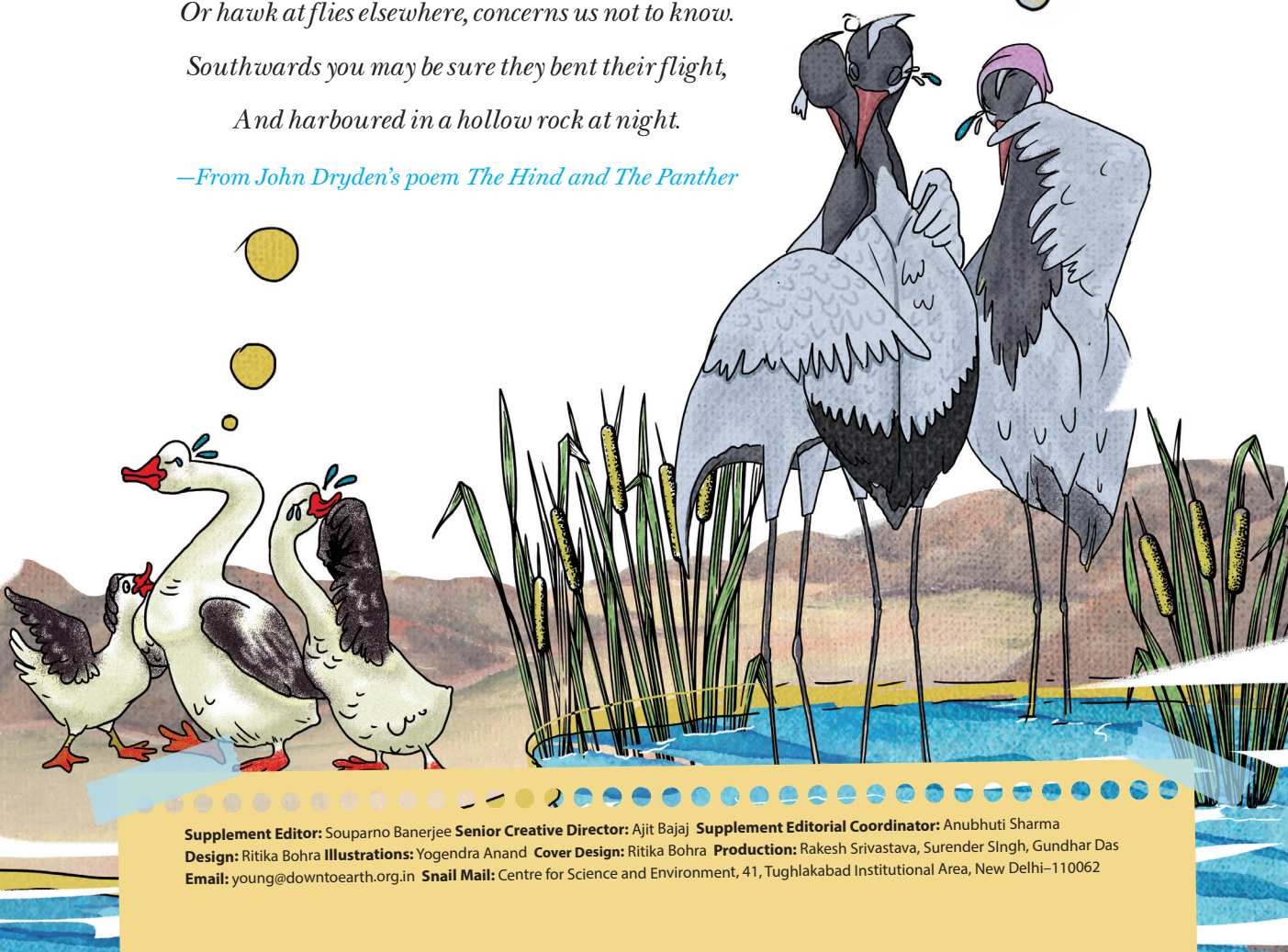
Or dream the winter out in caves below,

Or hawk at flies elsewhere, concerns us not to know.

Southwards you may be sure they bent their flight,

And harboured in a hollow rock at night.

*—From John Dryden's poem *The Hind and The Panther**



Somewhere in Central Asia, Mr and Mrs Demoiselle were worried. For, their little angel was venturing into the outside world for the first time. This was her first winter migration – to a world thousands of kilometres away. But she was confident; rather enthusiastic of her outing, which is a survival mantra for her species.

Just like Mr and Mrs Demoiselle, the Bar-headed Goose parents were sceptical about their son's very first long-distance migration at an altitude above 23,000 feet. He felt prepared and healthy enough to take any challenges.

Not only these parents, many other avian parents were equally worried and sceptical about their youngsters' journey into a faraway foreign land, just like we human parents worry about our kids travelling abroad for study. But all parents trust the mighty wings!

However, why do birds have to migrate? Before unveiling that mystery, let's understand smaller details.

What Bird Migration is All About?

The seasonal movement of birds travelling along a dedicated route, known as flyways, between the breeding and wintering grounds is referred to as bird migration. Migration in general happens from north to south, south to north, east to west, or southwards with sideway diversions.

Availability of food and potential nesting sites for breeding are the prime reasons behind bird migration. Birds living in highly seasonal environments may have no choice but to move to find

better food and nesting opportunities.

In India, obligate migration (winter migration), facultative migration (local migration) and altitudinal migrations are quite prominent.

Winter Migration

Advent of winter marks the start of the world's North-to-South bird migration. Most migratory birds to India come from Central Asia, Siberia, Mongolia, China, and Russia. Some come from extreme Western Europe like the Red-breasted Flycatcher. The migration pathway that the birds follow to reach Indian subcontinent is called Central Asian flyway.

Arctic Terns travel a whopping 1,00,000 kilometres from their Arctic breeding ground to Antarctic summering ground every year.

Perhaps this periodic travel started as an impact of the Ice Age that took place during the Pleistocene epoch (some 175 million years ago). It got imprinted into the DNA



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The movement and immobility of a bird involve costs and benefits but whatever ensures its survival and reproduction, it follows that strategy.

Many birds migrate due to their love for the fatherland or in other words philopatric nature (Philopatry is the tendency of an animal to remain in or return to its birthplace). Often, birds return to the same area where they had bred the year before even if it is tens of thousands of kilometres away.

Philopatry occurs for the wintering grounds too. Perhaps that's the reason why

of birds and influenced the phenomenon of bird migration.

The worst hit were the Polar Regions—birds from there dispersed to the southern warmer regions. Many returned to their original home once the Ice Age was over. But during this dispersal, birds got accustomed to fair winters in the wintering grounds. Hence, they returned there with the onset of every winter.

To migrate to their wintering grounds, birds follow different patterns, routes and directions. Which path and distance they choose, depends upon their physiological mechanism. Many songbirds prefer shorter



routes to cut down on energy expenditure. For example, Bluethroat, White Wagtail and Sulphur-bellied Warbler.

Few species prefer high altitude and long-distance migration. For example, Bar-headed Goose, Ruff, Bar-tailed Godwit and Demoiselle Crane. But most of the bird species avoid geographical barriers like high mountains, deserts and large open stretches of water. They select the passage with strategic stopovers to rest and refuel before resuming their migration.

How Do Birds Endure Physical Challenges During Migration?

Birds have a efficient energy distribution systems for supplying fuel and oxygen to their muscles and for removing carbon dioxide. It comprises a highly efficient lung, a large and fast-beating heart and a simple yet highly efficient digestive system.

Avian lungs receive oxygen during inhalation and exhalation. The unidirectional flow of air through their respiratory system enables their lungs to refresh with high oxygenated air constantly. An avian

lung has 'air sacs' attached to it.

When a bird inhales, air passes through its windpipe. Half of it moves to its lungs and the other half is stored directly in the air sacs called 'caudal sacs'. At the same time, deoxygenated air moves from the lungs into other sacs called 'cranial sacs'.

When a bird exhales, deoxygenated air from the lungs and the cranial sacs moves out via the windpipe while fresh air stored in the caudal sacs moves into the lungs. This system allows birds to receive fresh and oxygenated air throughout during inhalation and exhalation. This mechanism allows more oxygen to reach the blood and prevent high altitude hypoxia (oxygen deficiency in blood). This physiological evolution of the respiratory system in birds facilitates a higher metabolic rate, as well

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as the ability to fly at higher altitudes with less oxygen.

In case of low oxygen levels at high altitudes, a bird's heart comes handy. It weighs up to twice as much and pumps much more blood than that of a mammal of equal body size. A bird's heart rate can vary from species to species. But it's generally faster than a human's heart rate. The bigger and faster their heart beats, the more oxygen and nutrients it transports to their muscles. Further, the haemoglobin in their blood, binds more oxygen which helps under high-altitudinal conditions.

During migration, birds rely mainly on fat for energy because it gives them much more fuel than carbohydrates or proteins. To prepare, they eat a lot to store fat in their abdominal cavities. This extra foraging also temporarily enlarges their food-processing organs, helping them turn food into the fats needed for long flights.

Preferred Time for Travel

For migration, a few birds travel during day time; a few at night; and some travel during both. Song birds like thrushes, flycatchers and warblers prefer travelling at night to stay away from predators. The unique avian brain structure allows birds to sleep only one half of their brain at a time. By alternating the sleeping half of the brain throughout the night, birds can watch out for predators with one eye open and sleep with the other eye closed. Moreover, night skies are less turbulent and cooler which prevent their bodies from overheating during high-energy demanding flights.

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How Do Birds Remember Where To Go?

This is indeed a curious point of exploration. Do birds use some Global Positioning Systems like us? Else, how do they remember their migratory path and precise location? That's still a mystery. It is generally accepted that birds navigate using the Earth's magnetic field, solar, celestial, visual, auditory and olfactory cues.

They can sense Earth's magnetic field through magnetite (a type of iron oxide) present in their bill and nasal cavity. A light sensitive protein called 'cryptochrome 4' present in the retina of migratory birds helps them to visually detect this field. Birds, like Ruff, gather and store geomagnetic information for future use.

During day time the solar position and at night the movement of stars also act as indicators.

Low frequency oceanic sounds or mountain air traverse through great distances from which birds can gather potential information regarding distant shores and altitudes.

A few sea birds and vultures use their sense of smell to find the way back home.

Have You Seen A V-Formation In The Sky?

Many migratory birds travel in V or straight ribbon formation to conserve energy and for

better visual assurance while in flight. Each bird flies slightly above the bird ahead which helps in reducing the wind pressure. As the front bird flaps its wings, it creates lift for the bird following, thus allowing it to fly with less effort.

Cranes, ducks, geese, pelicans and storks fly in V-formation or in a line. When a goose falls off the formation, s/he realises quickly that it takes a lot of energy to fly alone. This returns him/her to the formation. While travelling a great distance in a large group, V-formation also helps in tracking every group member, and eases communication and coordination.

Prime threats to the migratory birds are habitat degradation and loss; agricultural expansion; infrastructure development; uncontrolled hunting; and climate change, leading to depletion in food resources and nesting opportunities. Thus, there is a dramatic decline in the number of migratory birds visiting India. Who can forget the extinction of a star species—the Siberian Crane that visited the Keoladeo National Park (Bharatpur, Rajasthan) till 2002!

The author is an amateur ornithologist and closely follows the avian world. All photographs are by Athiya Mahapatra.



Ganapathy Raju

Climate Conundrum

Reflecting on climate change, and its far-reaching and worrying consequences.

Simmering heat, maverick drought,
Togetherness of rain and floods.
World calls it climate change.
Many things unsaid, quite strange.

Not a word about resource greed,
None to question about the billionaires' creed.
Hunger and death, many mouths to feed.

We go to war to establish peace.
When will the lies and conundrums cease?

Reduction of emission is the current mission.
In agreements, inequity in wealth and access to
resources, a notable omission.

Western is the point of view.
Rest of the world take the cue.

If you have the currency, you can take it easy.
Short on resources, how will you make do, left
alone to find your sources.

The author is a freelance consultant in Bengaluru.



Book Review **HELP! My Aai Wants to Eat Me**

Bijal Vachharajani explores 'cute aggression' through a child's wild imagination in a heartwarming tale of trust, family, and hilarious misunderstandings.



Nandita Banerji

Have you ever looked at a baby, kitten, or puppy and thought, "I want to eat it!"? The feelings, also known as 'cute aggression,' are usually just expressions of overwhelming affection but play a key role in a hilarious misconception that serves as the foundation for Bijal Vachharajani's delightful book, *Help! My Aai Wants to Eat Me*.

Vachharajani introduces us to a young boy named Avi who takes his mother's affectionate expressions a bit too literally. Packed with vivid illustrations by Priya Kuriyan, this book uses the amusing exaggerations of a child's imagination to deliver a story.

The story unfolds as Avi, a cricket-loving and tinda sabzi-hating boy, witnesses a bear eating its cub. This scene sparks a wild imagination in his head, leading him to believe that his own Aai (mother in Marathi) might have similar intentions. Avi's fear and confusion are relatable to many children who have had overactive imaginations.

Vachharajani does an excellent job of capturing the innocence and vulnerability of childhood, especially the way children often misinterpret figurative language or playful teasing from adults. The precocious Avi's worries and the way he tries to avoid his imagined fate mirror the

anxiety children feel when they don't fully understand a situation but are too afraid to ask for clarification. His desperate attempts to escape his "doom" are equally hilarious and relatable.

While the book is light in tone, it subtly tackles deeper themes such as trust, family bonding, and communication. The exaggerated fear Avi feels serves as a reminder of the importance of addressing a child's concerns, no matter how silly they may seem to adults. In the end, the resolution is heartwarming, as Avi realises that his Aai's strange declarations were simply expressions of her overwhelming affection for him.

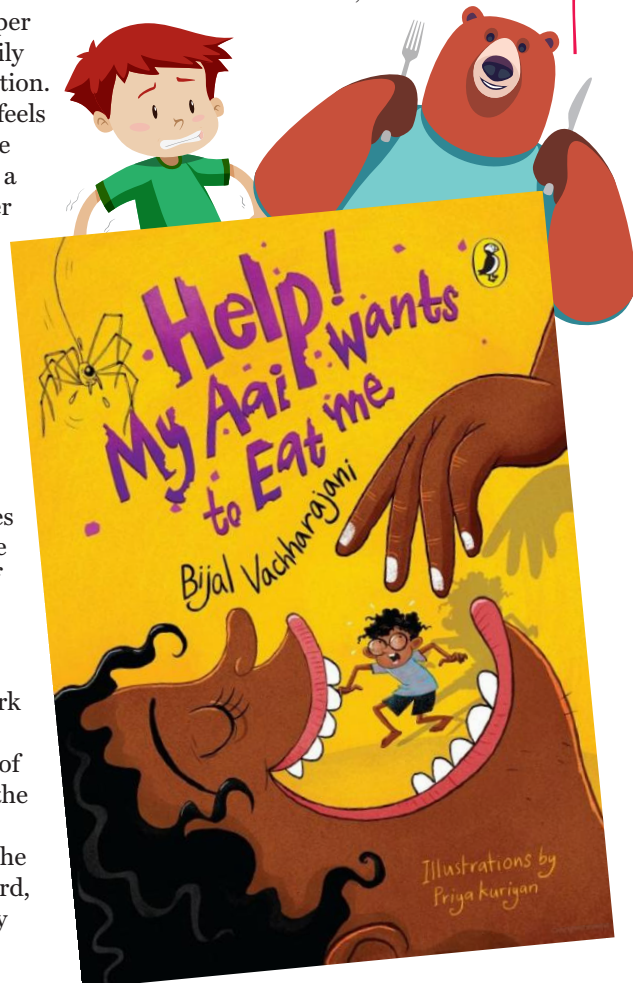
The book's strength lies in its ability to capture the innocence and humour of childhood. Vachharajani's writing style is engaging and easy to understand. Kuriyan's illustrations work perfectly with the story, enhancing the innocence of Avi and overall charm of the story.

While the premise of the book may seem a bit absurd, it's precisely this absurdity

that makes it so enjoyable. Avi's comical misunderstandings and his attempts to protect himself from his "cannibalistic" mother are sure to elicit laughter from both children and adults.

With a balance of humour and warmth, Vachharajani has crafted a delightful tale that will leave readers smiling.

Senior Sub-Editor, Down To Earth (Web), Centre for Science and Environment, New Delhi



Gobar ratings



CHOKER

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FOLIE LA FUMÉE

THE WORLD IS IN SMOKE

The 'Great Smog of London', also known as *The Big Smoke*, in December 1952 remains one of the most severe air pollution crises in European history, claiming an estimated 8,000-12,000 lives. Such environmental disasters don't occur overnight—they are preceded by numerous warning signs, much like the alarming pollution levels we are witnessing in Delhi today. One major culprit is nitrogen dioxide (NO₂), a dangerous air pollutant. When inhaled, it can lead to pulmonary edema—the buildup of excessive fluid in the lungs. Additionally, NO₂ plays a key role in the formation of photochemical smog, causing significant harm to both human health and the environment.